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ABSTRACT *Nearly four decades ago Stephen Marglin explored the origins of hierarchy in capitalist production with a divide and conquer hypothesis based on the idea that the monopolisation of knowledge about production technology plays a major role in explaining how workers are deprived of control over the labour process. Nevertheless, this explanation has some shortcomings that Marx and Babbage had avoided. Those two authors provided a highly accurate and convincing interpretation of the division of labour that remains relevant. The present paper proposes a general synthesis of their analysis. Two points are emphasised: (1) the division of labour plays a major role in wage determination; and (2) the division of labour largely determines the form of subjection of labour to capital.*

1. Introduction

Why and how do capitalists divide labour inside the production process? *The New Palgrave Dictionary of Economics* defines the social division of labour as 'the separation of employments and professions within society at large' and the manufacturing division of labour as 'the division of labour which takes place within the walls of a factory building or within the limits of a single industry' (Groenewegen, 2008). We owe this distinction to Marx. As noticed by Fine (1998, p. 177), 'Marx argues that the interaction between these two forms of the division of labour is both

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complex and indeterminate and not reducible by a technological imperative alone to the nature of the tasks themselves'. This theme was one of the major topics in economics during the 19th century but received little attention during the 20th century. Nevertheless, two major contributions on this issue were published almost at the same time, more than thirty five years ago: Marglin (1974) and Braverman (1974). Both are very critical towards the Smithian view based on the pin manufacture analysis and both emphasise that the division of labour is not a purely technical phenomenon; for both authors, the division of labour also involves the subordination of labour to capital in the production process.

Nonetheless, Marglin and Braverman construct their argument on different grounds. The latter applies the work of Babbage and Marx to the transformations of industry and services during the 20th century whereas the former tries to interpret the emergence of the very early forms of capitalist production using a combination of neoclassical tools and some non-standard elements. Marglin's innovative confrontation of the standard model with history leads him to propose his own heterodox 'divide and conquer' hypothesis to explain the subjection of workers in the production process. Marglin's paper goes further than most others in developing this theme, and it is one of the most quoted and influential non-mainstream papers challenging the neo-institutionalist wave. Yet Marglin's thesis exhibits a tension between two opposite interpretations which has been seldom noted (for an exception, see the Brighton Labour Process Group, 1977, pp. 7−8). It is however crucial for heterodox approaches to deal with such logical problems in order to support a credible theoretical alternative to the dominant model. As David Spencer (2000, p. 240) has recently noted, 'the challenge is to rejuvenate the radicalism of labour process analysis'.[1] Here we shall take up this challenge, following Braverman's example, by

[1] Spencer adds: 'If contemporary trends towards precarious employment and intensified labour are not to be accepted as "necessary evils" but instead understood in their specific connection with capitalist

presenting a new reading of the two fundamental authors on the technical, or minute, division of labour: Babbage and Marx.

Before going further, two questions have to be addressed in this introduction. First, why should we revisit Babbage and Marx? A major assumption underlying this paper is that the division of labour is one of the foundational elements of a heterodox theory of the organisation of production in modern capitalism. Given the influence of Marglin's article, we must inquire whether its argument should be considered a basic ingredient of such an approach. We shall argue that the 'divide and conquer' thesis fails to explain what Marx called the formal subjection of labour to capital, which does not ultimately rest on an uneven distribution of knowledge about production technologies, as Marglin contends, but on the division of society between a class of producers and a class of owners of the means of production. It is argued below that this class division, which is the essential feature of a capitalist society, cannot be deduced from the 'divide and conquer' thesis but on the contrary implies it. This points us back to Babbage and Marx, who expounded a robust theoretical framework for explaining why capitalists divide labour within the production process.

The second question is: what can be added to our knowledge of Babbage and Marx on the division of labour? The non-mainstream literature on the labour process (e.g. Brighton Labor Process Group, 1977; Elbaum *et al.*, 1979; Lazonick, 1979, 1990, 1991; Rubery 1978; Burawoy 1979; Coriat 1979) has not provided a genuine synthesis of the insights of Marx and Babbage. Even Braverman (1974) who played an important role in unearthing Babbage's contribution has neither tried to dissect the latter's *Economy of Machinery and Manufacture* (1832) nor to show in detail how it connects to the argument developed by Marx (1867) in chapters 13 to 15 of *Capital*, Vol. I and in the so-called 'Chapter Six' (the existence of which was probably unknown

production, then the position of "critique" must once again take precedence in labour process analysis.'

to Braverman). It is hence not superfluous (i) to explain precisely how, for Babbage, the division of labour is used to cheapen labour power through narrow specialisation and task simplification, and how such a process forms the basis for the replacement of labour by machinery; (ii) to clarify Marx's distinctions between subjective and objective division of labour and between formal and real subordination of labour to capital; (iii) to show that the division of labour under capitalism involves a double-sided process of the organisation of production and of management reflecting the dual nature of capitalist production, which is based on both cooperation and exploitation (though the cooperative aspect often goes unnoticed by the critical tradition); and (iv) to clarify the link between increasing returns and the division of labour.

The paper is organised as follows. Section 2 describes Marglin's analysis of the division of labour and outlines the main difficulties displayed by the 'divide and conquer' explanation. Section 3 gives a reading of Babbage's decisive contribution and Section 4 shows how Marx largely resumes the argument of the latter and deepens it by emphasising the coercive aspect of the division of labour.

2. Marglin

The main question addressed by Marglin in his 1974 paper on what bosses do is this: why are some individuals specialised in directing and commanding, and others specialised in obeying and executing the orders of the former? In other words, are there technological or economic reasons which could legitimate subjection of labour to capital in the sphere of production, and which could explain the division of labour between workers and bosses? Marglin gives a twofold answer to this general question. He begins with a refutation of Smith's argument on the division of labour; then he proposes his own analysis, by borrowing from political analysis the notion of

'divide and conquer'.[2]

It should be noted that Marglin is not particularly heterodox: his analysis is neither old institutionalist nor Marxist in character. He applies standard neoclassical analysis. His originality lies rather in his resort to history: he states that standard theory is invalided by historical events but, instead of looking for explanations given by other theorists concerned with history on this subject, he proposes his own thesis. As we shall see, Marglin's argument is not fully convincing, which obliges us to turn to two old masters, Babbage and Marx, to understand more clearly the reasons why capitalists divide labour within the firm.

2.1. Marglin's Critique of Smith's Argument

For Smith, the division of labour is the main cause of increases in labour productivity. In the famous pin factory example, Smith (1776, Bk I, ch. 1) argues that the division of labour has three effects: (1) it increases individual dexterity; (2) it saves time that would otherwise be lost when moving one task to another; and (3) it encourages the invention of new machines.[3] Marglin, contends that Smith fails to understand properly the minute division of labour.

The second effect, for Marglin, can hardly justify the capitalist division of labour because 'to save "the time which is commonly lost in passing from one species of work to another" it is necessary only to continue in a single activity long enough that the set-up time becomes an insignificant proportion of total work time. At most, the saving of time would only require that each worker continues in a single activity for days at a time, not for a life-time. Saving of time implies *separation* of tasks and *duration* of activity not *specialisation*' (Marglin, 1974, p. 67;

[2] For an overview and assessment of Marglin's contribution to radical political economy during the 1970s, see Tinel (2004).

[3] See Groenewegen (1977) for an assessment of Smith on the division of labour.

emphasis added). As to the third argument, Marglin observes that Smith himself is not completely convinced, since a specialised production worker, whose task does not require him to exert his mind, is all the less likely to invent any kind of machine. Finally, concerning dexterity, Marglin (1974, pp. 68−69) is right to observe that

> if Adam Smith were talking about musicians or dancers or surgeons, or even if we were speaking of the division of labor between pin-making and cloth-making, his argument would be difficult to counter. But he is speaking not of esoteric specialisations, nor of the social division of labor, but of the minute division of ordinary, run-of-the-mill, industrial activities into separate skills. ... To the extent that the skills at issue are difficult to acquire, specialisation is essential to the division of production into separate operations. But, judging from the earnings of the various specialists engaged in pin-making, these were no special skills.

This objection is linked to the classical argument that Smith confuses social and technical division of labour.

Thus, according to Marglin, Smith's arguments cannot justify the existence of a minute specialisation particular to the division of labour. The best that the first and second arguments can do is to support the idea that the division of labour induces some modest improvements in productivity, gains that are too small to allow the division of labour to play the major role ascribed to it by Smith. Unfortunately the alternative explanation that Marglin put forward to analyse the shift from pre-capitalist handicraft organisation of work to capitalist specialisation is also problematic.

2.2. The Division of Labour as a Divide and Conquer Strategy

Marglin's idea is that specialisation was introduced by capitalists under the putting-out system to

divide and conquer, and then to divide and rule, the production process. According to this argument, the division of labour did not increase productivity. It was simply a power strategy for capitalists to become essential, to create their function, as integrators of the separate operations that enter into the manufacture of a single commodity, without being genuinely productive.

The argument is in tension between two interpretations. On the one side, the 'divide and conquer' thesis emphasises the relation between technology and social organisation. This remarkable trait of Marglin's analysis distinguishes his approach from both neoclassical and some Marxian orthodoxies of the 20th century. The rejection of technological determinism was one of the main themes in radical political economy during the 1970s, and Marglin's interpretation helps to explain the influence of his 1974 paper. But, on the other side, the very basis of his argument is essentially neoclassical, and does not match the historical sequence it is supposed to explain.

The 'divide and conquer' argument

Marglin starts by observing that in the pre-capitalists forms of production, the guild workman controls both the production and the marketing processes. This contrasts with capitalism where the worker does not sell a product but only his labour power. In the capitalist organisation of production, there is therefore an intermediary between the producer and the market; moreover, the worker no longer controls the labour process. Rejecting the Smithian technological argument, Marglin builds a two-stage explanation: first, the capitalist interposes himself between the worker and the market which gives rise to the putting-out system; and then, in the next stage, the capitalist takes over the production process which initiates the rise of the factory system.

Marglin compares the divide and conquer strategy to the political strategies used by

colonial powers to exploit pre-existing differences and impose their domination by making themselves essential. There was no technological superiority of the first capitalist form of production—the putting-out system—over the pre-capitalist one. The putter-outer has neither a special ability to integrate separate functions; nor does he introduce new methods of production: he only divides the production process and assigns workers to different production tasks, imposing himself as the sole integrator of the final product. Blocked from access to a large market, because he produces only an unfinished product with almost no outlets for sale, instead of a finished commodity, each worker then becomes dependent on the putter-outer. The latter's function is hence supposed to have been 'artificially created to preserve the capitalist's role' (Marglin, 1974, p. 70). The capitalist division of labour is mainly viewed as a device for controlling the labour force, in contrast with Smith's technological interpretation which completely ignores this aspect.

Intensification of competition between capitalist putter-outers makes it ever more necessary for them to control not only the selling of the product but also the labour process itself in order to minimise costs. Under the putting-out system, workers were free to choose between work and leisure because they still controlled their labour process. By concentrating workers in their factories under their direct supervision and discipline, capitalists gain direct control over workers whose choice from then on is limited to 'whether or not to work at all' (Marglin, 1974, p. 93). This enables bosses to reduce costs by intensifying work effort, without necessarily increasing wages. Cost savings in this case are not motivated by the pursuit of technological efficiency, and the neoclassical model does not apply: 'the discipline and supervision afforded by the factory had nothing to do with efficiency.… Disciplining the work force meant a larger output in return for a greater input of labour, not more output for the same input. Supervising…

the work force simply reduced the real wage.… [This] changed the division of the pie in favour of capitalists' (Marglin, 1974, p. 94−95).

Lastly, among other non-standard features, Marglin's approach underscores the role of class struggle in capitalist development. In particular, he develops the heterodox idea that technology is socially produced. Nevertheless, his argument is not without some questionable features, which we shall now examine.

The knowledge argument

What could prevent workers under the putting-out system from integrating the whole process of production and thus from crowding out capitalists? Marglin's answer is ambiguous because, beside the heterodox aspects emphasised above, he also considers another element: 'without specialisation, the capitalist had no essential role to play in the production process. If each producer could himself integrate the component tasks of pin manufacture into a marketable product, he would soon discover that he had no need to deal with the market for pins through the intermediation of the putter-outer' (Marglin, 1974, p.70). Marglin considers that knowledge is the central point here: the workers who could acquire or 'discover' the knowledge of the whole process of production would then also become capitalists themselves.[4] This side of Marglin's

[4] Marglin's ambivalence between the Marxian argument based on property in the means of production, on the one hand, and the knowledge argument, on the other, is starkly evident in his story of the sandal maker: 'I know a man who was for a time a sandal marker. To learn the trade, he went to work for a "master" sandal maker. This worthy systematically taught him all there was to know about making sandals—except how to buy leather. My friend could have learned this vital aspect of the trade on his own by the familiar and time-honored method of trial and error—if he had had $1000 or so to set aside for the mistakes inherent in the learning process. Lacking the capital, his boss's unwillingness to share one particular skill effectively obliged him to remain a worker as long as he remained in the trade' (Marglin, 1974, p. 72).

approach explains why his article has been cited by the new orthodoxy, which views the labour process as information-creating, and the subordination of labour as an organisational innovation which enhances Pareto efficiency.

From this perspective, specialisation is a way for capitalists to keep workers ignorant of the technical process and to remain essential as the sole party able to integrate the different operations into a single marketable product. Marglin developed this Austrian-flavoured argument in later work (Marglin, 1984).

But this account of the division of labour does not fit well with the historical period it aims to understand. Indeed, it is based on an inversion of cause and effect concerning the analysis of the monopolisation of knowledge by the capitalist class. Marglin's knowledge thesis holds only if knowledge of the craft has been lost by the workmen *before* the intervention of the capitalist. In other words, to be effective, the divide and conquer strategy described by Marglin requires the producers to discard the capacity to produce the commodity as a whole. But this hypothesis does not fit the historical period to which it is supposed to apply because its starting point is precisely the pre-capitalist handicraft organisation where every single producer knows how to produce a commodity from beginning to end of the process, as noticed by Marglin himself at the beginning of his 1974 article.

The elimination of the producers' knowledge of their craft did not precede the advent of the capitalist division of labour. It is rather a result of this transformation. The deprivation of the workers' knowledge is not a cause of the capitalist division of labour but its consequence. A more credible hypothesis is presume that workers accepted subordination to the putter-outers not because of their ignorance of the production process, but because they had no other option to survive. We will develop this thesis later in the discussion on Babbage and Marx.

Marglin was unable to give a convincing explanation of the minute division and specialisation of labour. His approach overemphasises the role of information, and ignores what has come to be known as the 'Babbage principle'—the idea that the division of labour is used by capitalists to reduce labour cost. Marglin mainly pointed out an intensification effect based on discipline and control, but we will see that Babbage's analysis is in a way more radical. In other words, the 'divide and rule' hypothesis, which is the heterodox side of the argument, can be more satisfactorily grounded in the work of Babbage and Marx.

3. Babbage

Before Marx, Charles Babbage had probably made the greatest effort to understand the logic of the manufacturing division of labour. Babbage was a scientist who was particularly interested in machinery. His research led him to investigate how to introduce and generalise machinery in manufacturing and drove him to the analysis of the division of labour inside the workshop. Babbage is largely ignored by contemporary literature on the division of labour. This neglect is unfortunate, and it is significant that one of the few modern attempts to measure the division of labour empirically is based upon Babbage's method (see West, 1999). We owe to Harry Braverman (1974), in his celebrated book on the transformations of the labour process during the 20th century, most of the credit for the rediscovery of Babbage's work on the *Economy of Machinery and Manufacture* (1832). Whereas Smith considered the division of labour on the basis of its pure physical or technical effects in terms of productivity without any reference to wages, Babbage immediately applies an economic approach with monetary *prices*. He seeks an 'explanation of the cheapness of manufactured articles, as consequent upon division of labour' (Babbage, 1832, p. 115). This issue is equivalent to Marglin's question: what is the *economic*

gain for capitalists of dividing the labour process? Wondering what the economic benefit in the division of labour is to those who decide to implement it led Babbage to consider how increasing productivity is neither the sole nor the main effect of specialisation. Moreover, Babbage shows that this particular way to organise labour is mainly a means to reduce wage costs because it enables the manufacturer to select skills accurately.

Before exposing what has been called his ‘principle’, Babbage reviews the classical arguments favourable to the division of labour and specialisation. Some of them, like set-up time, he describes without significant modification; others like ‘the time required for learning’ are reinterpreted with clear-sightedness. We first consider the classical arguments that he accepts without modification.

3.1. The Classical Arguments that Babbage Accepted without Modification

The Smithian argument of the time ‘which is commonly lost in passing from one species of work to another’ is split by Babbage into two sub-arguments. One deals with ‘changing from one occupation to another’ in general, whereas the other focuses particularly on the change of tools. But both discussions amount roughly to what Smith put forward. On the ability to invent machines, Babbage makes a subtle distinction between tools, supposed to be effectively improved by workers, and machines, which require special skills to be imagined. This passage is also the occasion for Babbage to emphasise how the division of labour prepares the way for mechanisation: ‘Such an improvement in the tool is generally the first step towards a machine.... When each process has been reduced to the use of some simple tool, the union of all these tools, actuated by one moving power, constitutes a machine’ (Babbage, 1832, pp. 114−115).

The first important element that is worth pointing out is dexterity. We saw before that this

is the main argument by which Smith explains the division of labour. Babbage contests the relevance, or at least the primacy, of this factor. He considers its impact to be temporary; its advantage over manufactures with processes that are less subdivided tends to disappear quickly: ‘for, thought it acts at the commencement of an establishment, yet every month adds to the skill of the workmen; at the end of three or four years they will not be very far behind those who have never practised any other branch of their art’ (Babbage, 1832, p. 114). So we may now turn to what Babbage himself considered the most essential argument on this issue.

3.2. The Apprenticeship Period

Before turning to Babbage’s famous ‘principle’, it will be useful to examine his discussion of the ‘time required for learning’. Babbage (1832, pp. 112−113) notes at the beginning of his chapter 19 that ‘the proportion of time occupied in the acquisition of any art will depend on the difficulty of its execution; and that the greater the number of distinct processes, the longer will be the time which the apprentice must employ in acquiring it.’ Marglin made a similar point, but the reasoning here is different from Marglin’s contest of specialisation as a means to achieve significant improvements in productivity. Babbage goes further on the issue of learning. For him, the division and specialisation of labour reduces the time, and thus the cost incurred by the employer, of apprenticeship:

> Five or seven years have been adopted, in a great many trades, as the time considered requisite for a lad to acquire a sufficient knowledge of his art, and to enable him to repay by his labour, during the latter portion of his time, the expense incurred by his master at its commencement. If, however, instead of learning all the different processes for making a needle, for instance, his attention be confined to one operation, the portion of time consumed unprofitably at the commencement of his apprenticeship will be small, and all

> the rest of it will be beneficial to his master: and consequently, if there be any competition amongst the masters, the apprentice will be able to make better terms, and diminish the period of his servitude. (Babbage, 1832, p. 113)

Babbage notes that specialisation is beneficial to the apprentice, for it reduces the period during which he has to stay at his master's workshop; but this gain of formal liberty for the young workers is only a secondary aspect of the issue.

The central point for Babbage is that the master, who decides how to utilise the labour that he hires and how to organise the production process, has an incentive to implement the minute division of labour and specialisation because it increases the amount of time, over the entire period of employment, during which his young employee works for him profitably. As required skills diminish with minute specialisation, the time and the cost to produce a new worker of sufficient skill is reduced. But, this cost reduction in the production of a worker suited to the tasks designed for him by his boss is beneficial to the master for a more basic reason: 'the facility of acquiring skill in a single process, and the early period of life at which it can be made a source of profit, will induce a greater number of parents to bring up their children to it; and from this circumstance also, the number of workmen being increased, the wages will soon fall' (ibid.). Thus, in the end the minute division of labour and specialisation reduce the price of labour because it increases the supply of labour suited to a particular job.[5] As we shall see below, this original argument indirectly plays a major role in Babbage's 'principle'. We shall also see how Marx strengthens significantly Babbage's sharp intuition about the effect of specialisation on the

[5] Babbage (1832, p. 113) notes that, in addition to its affect on wages, the minute division of labour also reduces waste of raw material: 'if each man commit this waste [of raw material] in acquiring successively every process, the quantity of waste will be much greater than if each person confine his attention to one process; ... therefore, the division of labour will diminish the price of production.'

supply of labour.

Babbage's argument is very different from the one advanced by Smith and those who came after him, such as Marshall. Babbage argues that manufacturers introduce minute specialisation not for productivity reasons but for a motive of profitability.[6] What is original here, compared to other common discussions on the division of labour, is that bosses have an incentive to use minute specialisation even if it yields no increase of productivity.

3.3. The Babbage Principle

Let us now consider Babbage's 'principle', which is his main explanation of why manufacturers divide and specialise labour. The principle states:

> That the master manufacturer, by dividing the work to be executed into different processes, each requiring different degrees of skill or of force, can purchase exactly that precise quantity of both which is necessary for each process; whereas, if the whole work were executed by one workman, that person must possess sufficient skill to perform the most difficult, and sufficient strength to execute the most laborious, of the operations into which the art is divided. (Babbage, 1832, p. 116)

Babbage then undertakes a quantitative examination of the production process in the famous pin factory example, comparing the cost of production in the case of minute specialisation with the case of no specialisation. He concludes that dividing and specialising the work allows a reduction of the monetary cost of production. This analysis is an applied demonstration of his principle. Then he delivers his conclusion as a prescription for capitalists who wish survive

[6] It is striking to see how authors who advocate the 'Smith-Marshall-Young' model, such as Lavezzi (2003) and Rima (2004), thoroughly ignore the logical shortcomings raised by critics like Babbage and Marglin.

competition and increase their earnings: ‘The higher the skill required of the workman in any one process of a manufacture, and the smaller the time during which it is employed, so much the greater will be the advantage of separating that process from the rest, and devoting one person’s attention entirely to it’ (Babbage, 1832, p. 122).

Thus the Babbage principle says that the minute division of labour is a way for a capitalist to reduce his demand for skilled workers and hence to increase the use of lower-waged unskilled workers. His approach is neither prescriptive nor normative: he explains how those who organise production, the capitalists, have an incentive to divide work and then to replace work by machines. He does not concern himself with any supposed ‘efficiency’ criteria which might override particular interests. In Babbage’s framework a shift from one situation to another does not necessarily benefit all parties: he does not try to conceal the conflicts, class struggle and coercion which lie behind transformations in the production sphere.

At this point Babbage does not explain why the increase in demand for unskilled labour would not balance the increase of supply. Nor do we know why he supposes that the wage bill should decrease because of the division of labour. It is only in chapter 32 ‘On the effect of machinery in reducing the demand for labour’ that Babbage revisits this issue. The short-term ‘effect of new machines is to diminish the labour required for the production of the same quantity of manufactured commodities’ (Babbage, 1832, p. 213). He believes, though, that mechanisation typically leads to a net increase in the demand for labour, because of the increased demand for labour to build the machinery (ibid., p. 214). But the workers who are displaced by machines are not those who build them because ‘Frequently the new labour requires ... a higher degree of skill than the old; and, unfortunately, the class of persons driven out of the old employment are not always qualified for the new one; so that a certain interval must elapse

before the whole of their labour is wanted' (ibid.).

Marx took up and completed Babbage's analysis.

4. Marx

We will focus only on the passages of *Capital* that are pertinent to the topic at hand, mainly chapters 13, 14 and 15, and on what has come to be called 'Chapter six'.[7] We will see how Marx uses Babbage's argument and goes beyond it to show that the division of labour contributes to the production of both use values and surplus value, so that we must bear in mind not only technical considerations but also social factors such as class struggle. Marx integrates the theoretical analysis of the division of labour into the historical analysis of capitalist development, which he views as shaped by social conflicts that partially determine the organisation of production and the choice of technology.

We begin with Marx's explanation of why capitalists gather many workers under their command, in which fixed costs play an important role that is generally ignored by other authors, including Babbage. Then Marx exposes the logic of minute specialisation, which prepares the way for mechanisation and for the development of the objective division of labour. The division of labour is, for Marx, not a purely physical phenomenon, as suggested by the Smithian tradition, but a coercive device aimed at facilitating accumulation.

4.1. Cooperation and Increasing Returns

For Marx, the point of departure for any capitalist form of production is cooperation: capitalist

[7] The draft entitled 'Chapter 6. Results of the Direct Production Process' was probably written in 1864. Marx had apparently intended at one point to include it in *Capital* Volume I, but in the end he set the argument aside. This manuscript remained unpublished until the 1960s, when portions of it appeared in Italian and French.

production necessarily involves several people working together.[8] Thus, by definition, cooperation is opposed to individual and scattered production which cannot be considered as capitalist. Why do capitalists employ many workers together? Babbage had nothing to say on this issue. For Marx, employing several workers at the same time for the same purpose generates more surplus-value than can be obtained by the same number of people working separately. The set of workers collectively producing this additional surplus-value is not reducible to the sum of its components. It forms a collective labourer. Cooperation opposes itself to individual production and thus also opposes producers' dispersion of labour.

By definition, this social productive power of labour involves increasing returns to scale. These gains of cooperation ensue from two sources. On the one hand, cooperation allows economising on fixed costs and, on the other, the additional force attached to the collective labourer is above all a result of simultaneity and combination of actions oriented towards a common objective. Since fixed costs increase with the total value of constant capital (machines), increasing returns become more significant with the accumulation of capital over time, i.e. with the development of the capitalist division of labour.

According to Marx, capitalists started by concentrating many handicraft workers in the same place in factories in order to realise and appropriate the additional surplus-value created by the social productive power of labour. At this stage, workers remained in possession of their trade. Thus capital could not fully control the production process; subordination of labour to capital was purely formal: the capacity of the capitalist to control the worker rested only on the economic dependency of the latter. The formal subordination of labour corresponds to the

[8] As used here, the word has nothing to do with any normative idea of common good or common interest; it merely designates the collaborative nature of production. For a critical discussion of Marx's notion of cooperation, see Lazonick (1990, pp. 58−67).

absolute surplus value (see Table 1). The lay-off threat was hence considered by Marx as the primitive moment of subordination of labour to capital. Nevertheless, this formal capacity was decisive, for it enables capitalists to implement the first stage of the minute division of labour and specialisation. This phase, the subjective division of labour, consisted in breaking up the trade and then destroying individual control over the production process by having workers specialise on a limited range of tasks.

Formal Subordination of Labour	Real Subordination of Labour	
Absolute Surplus Value	Relative Surplus Value	
Cooperation	Division of Labour in Manufacture	Factory System (Machinery)
Precapitalist Division of Labour	Subjective Division of Labour	Objective Division of Labour

Table 1: Correspondence between subordination, surplus value and division of labour

4.2. The Subjective Division of Labour

A trade is made of a set of various skills and techniques, the acquisition of which is relatively time consuming. It rests upon dexterity associated with several more or less specific and sophisticated manual tools. The craftsman both conceives and carries out his own work; there is no separation between conception and execution. Indeed, the trade enables the worker to control the production of a whole commodity, to be an independent producer.

According to Marx, the first movement towards real appropriation of the production process by capital corresponded to the development of the subjective division of labour.[9] This phenomenon had already been described by Babbage. The early stage of minute division and

[9] For Marx, the term ‘subjective’ refers to human beings and the term ‘objective’ to things.

specialisation consisted in breaking up trades in order to reconstitute the whole production process on the basis of the tasks comprising it. This division of labour is subjective in the sense that task separation and specialisation does not rest upon a material process but on a convention, or an obligation, imposed on workers by the employer.

Until then, the same technique could be used by different trades inside the same manufacture. This technique was then mastered by craftsmen of different trades. And those craftsmen had also mastered several techniques, for which the training time could be long. But with the new division of labour, workers specialised in only one task, and trades remained in manufactures only at the level of the collective labourer instead of the individual craftsmen. As a consequence, Marx argues, a new specialisation limiting individual skill took place not around trades but around methods composing them. From a combination of trades, manufacture then became a combination of processes. With increasing demand and concentration of capital, the intensification of production led each operation to be subdivided in its turn. Mechanisation had not yet developed in manufactures.

Productivity gains were produced by the division of labour at only two levels. On the one hand, set-up time was reduced, diminishing the porosity of the working day: more work was realised per day, its intensity increasing. On the other hand, individual dexterity also increased; but it was especially at the level of the collective labourer that the trade was mastered better in terms of dexterity compared to individual craftsmen. At this point in his reasoning, Marx summarises Babbage’s idea and quotes his famous principle in a footnote.

This new organisation of specialised labour segments work and creates a detailed hierarchy of wages. Under this segmented work, a class of unskilled labour developed, so that even the absence of specialisation becomes a speciality. Compared to handicraft, the labour force

became either specialised into a few tasks or not specialised at all. Marx, like Babbage, emphasises the economic effects induced by this shaping of the production process in accordance with the needs of capital: minute specialisation requires less apprenticeships which reduces their value and increases (relative) surplus-value all the more:

> Alongside of the hierarchic gradation there steps the simple separation of the labourers into skilled and unskilled. For the latter, the cost of apprenticeship vanishes; for the former, it diminishes, compared with that of artificers, in consequence of the functions being simplified. In both cases the value of labour-power falls.... The fall in the value of labour-power, caused by the disappearance or diminution of the expenses of apprenticeship, implies a direct increase of surplus-value for the benefit of capital; for everything that shortens the necessary labour-time required for the reproduction of labour-power, extends the domain of surplus-labour. (Marx, 1867, p. 240).

The essence of minute division and specialisation for Marx is that, by transforming the complex labour of craftsmen into simple labour of unskilled workers, it reduces the labour-time necessary for the reproduction of labour-power, which amounts to a reduction of wages. Specialisation shifts distribution in favour of capital not so much because of the increase in productivity as because of the reduction of value of labour power that it directly induces. Indirectly, the division of labour increases competition amongst workers at each level of the skill hierarchy because each job, being simplified and hence easier to perform, can now be done by a greater number of workers. Minute specialisation makes each individual worker more dispensable and more easily replaceable for the employer. For Marx, as for Babbage, the main economic effect pursued by capitalists with the division of labour is to reduce the bargaining power of workers.

The minute specialisation dispossesses the individual worker of control over the whole

production process, which now exists only at the workshop level. Mastery of knowledge of the craft exists only at the collective level, and hence could be appropriated by capital, just as it appropriated the social productive power of labour. Capital seeks to dominate all knowledge useful for its valorisation: by separating conception from execution, the minute division of labour renders workers subject to capital and increases their dependency (see Marx, 1864). From that moment, the labour process is not shaped by the producer but by capital for its own valorisation. The worker cannot work in his own way anymore, but is constrained to work as his employer dictates. He is now constrained not only by the threat of dismissal, but also by the material organisation of the labour process itself. Even though mechanisation has not yet occurred, the subjective division of labour enables capital both to start subordinating labour in earnest and to trigger the process of relative surplus-value (see once again Table 1).

It is important to note that the dispossession of the worker's knowledge of his trade is not the cause but the consequence of the subordination of labour to capital: Marx's argument clearly shows why Marglin's explanation based on the monopolisation of knowledge is not persuasive. We have seen how Marx does not need to assume that in the earliest stage of capitalism workers accept subordination to capital because they lacked the knowledge needed to produce commodities. On the contrary, he recognises that the first workers who were subordinated to capital were still controlling their own trade. These workers accepted loss of liberty simply because they had no choice: they did not have enough money to buy raw materials and to maintain themselves until their products were ready for sale. Economic dependency, resulting in particular from primitive accumulation, precedes the monopolisation of knowledge. This idea is nicely expressed by Marx in a famous passage from the chapter devoted to the buying and selling of labour-power:

> Nobody—not even ‘a musician of the future’—can live upon future products, or upon use-values in an unfinished state; and ever since the first moment of his appearance on the world’s stage, man always has been, and must still be a consumer, both before and while he is producing. In a society where all products assume the form of commodities, these commodities must be sold after they have been produced, it is only after their sale that they can serve in satisfying the requirements of their producer. The time necessary for their sale is superadded to that necessary for their production. (Marx, 1867, p. 117−118)

Section 4.4 will consider the issue of the causality between knowledge and subordination from the other side of the coin, i.e. command and coercion.

Like craftsmen’s bodies, tools were transformed and adapted; they became specialised and more and more differentiated from one another. Those improvements and simplifications, on the one hand, fitted the needs of specialised labour and, on the other, ‘create[d] at the same time one of the material conditions for the existence of machinery, which consists of a combination of simple instruments’ (Marx, 1867, p. 236).

4.3. The Objective Division of Labour

Mechanisation enables production to be carried out on a much greater scale than is possible using muscle power. Until the emergence of the factory system, the division of labour in manufactures was *subjective* because tasks were designed in advance for workers; but within the factory, the division of labour becomes *objective*, in the sense that it is embodied in machinery, to which the workers are compelled to adjust. Once subdivision of tasks took place in manufacturing, workers were replaced in the factory by machines designed by capital for its own purposes. The instruments of production start competing with the labour force, but not all forms

of labour disappear: machinery needs to be operated and maintained by unskilled labour, and labour is also necessary to build it.

The rise and the diffusion of machinery from one branch to another in industry induce a double movement. At the level of use, mechanisation renders specialised labour in manufactures useless because when it is adopted only unskilled and undifferentiated labour is needed on the shop floor, while some skilled labour is still retained at the top of the hierarchy to perform conceptual and managerial functions for the benefit of capital. When it comes to the production of machinery itself, a new industry emerges: building machinery initially requires craftsmen and specialists. The sector which produces machines itself progressively becomes mechanised, and the minute division of labour appears and develops in this branch. With the generalisation of machinery, technical change leads to the gradual replacement of obsolete machines by more advanced machines. The machinery process creates a bi-polarisation of the labour force. Specialised workers are replaced by an undifferentiated labour force while a labour force specialised in the production, maintenance and monitoring of machinery is then required by capital. The latter group forms a class of superior workers which Marx thought would be numerically insignificant. But this binary segmentation is never achieved as such, it is only a process which is activated and interrupted as machinery develops in new domains and as other activities disappear. Of course, Marx makes the hypothesis that the share of unskilled labour tends to rise, but actual labour force segmentation involves not two but several layers.[10]

With machinery, the capital is not only able to do without muscle-power but also without the specialised manufacturing worker on the shop floor; skilled labour power is still used mainly for conceptual work and management. A superfluous population is created by machinery,

[10] The literature on labour market segmentation is huge and cannot be examined here; for an overview see Fine (1998).

increasing all the more the competition among workers, and reducing still further the value of labour power. Factory workers become easily replaceable. Whereas manufacturing workers still control collectively the mastering of trades they had lost individually, the subjection to machinery definitively deprived labour of any control over the production process, to the benefit of capital.

4.4. The Division of Labour as a Coercive Device

Very few economists would argue today that ‘in a perfectly competitive market it really doesn’t matter who hires whom’ (Samuelson, 1957, p. 894) and yet, in recent literature on ‘the organisation’ or ‘the firm’ it is seldom clear why, and in what terms, some people exercise command over others. The purpose of this last subsection is to recall the implication of Marx’s analysis of cooperation, which remains particularly essential on this issue and has been largely overlooked even by the Marxist tradition itself. After stating to what extent cooperation involves coordination, whatever the mode of production, the double nature of command in capitalist production is clarified.

As noted above, for Marx, cooperation constitutes the foundational feature of capitalist production. The social productive power of labour is created both by emulation and by the simultaneous conjunction of individual forces oriented towards a common objective. At this very primitive level of organisation, there is no minute division of labour: the workers either do the same thing or practice different crafts in the same field of work. The special productive power of the collective labourer results only from the joint action, which presupposes a common goal and a concerted plan. The more numerous the labourers working together, the more it is necessary to organise the set of simultaneous actions, for otherwise disorder could limit the productive effect

of the combination of activities. Cooperation creates a specific need for direction to coordinate individual activities because it is presumed by Marx that decentralisation of individual actions is not able to lead to self-organisation. This idea is expressed by the metaphor of the orchestra and the conductor:

> All combined labour on a large scale requires, more or less, a directing authority, in order to secure the harmonious working of the individual activities, and to perform the general functions that have their origin in the action of the combined organism, as distinguished from the action of its separate organs. A single violin player is his own conductor; an orchestra requires a separate one. (Marx, 1867, p. 227)

Marx supposes that coordination requires a specific function with specific skills. The simple cooperation, which creates this '*work of directing, superintending, and adjusting*' (Marx, 1867, p. 227), existed even before the capitalist era in all civilisations, but at that time it was only employed sporadically to raise dolmens, pyramids, cathedrals or temples. Therefore, the direction function which comes from the need for coordination inherent in simple cooperation is not itself produced by the social organisation in which it takes place; it is transhistorical: '*co-operation is a necessary concomitant of all production on a large scale, but it does not, in itself, represent a fixed form characteristic of a particular epoch in the development of the capitalist mode of production*' (Marx, 1867, p. 229). In other words, the direction function ensuing from the social aspect of production is not unique to capitalism: it is necessary whenever many people work together.

When many labourers are working together, the simultaneity and combination of their actions create a new productive force. This social productive power of labour resulting from cooperation can only exist if individual actions are properly and consciously coordinated. This

specific function of command that consists in coordinating is not in itself despotic. It is not created by a particular exploitation system: it is revealed in many different types of societies throughout history.

But what are the features of command specific to capitalist production? For Marx, there is a distinctive relation between simple cooperation and capitalism. Whereas pre-capitalist economic systems are marked by a dispersed and individualised process of production in which the worker is subject only to the conventions of his trade (i.e. craft, *métier* or profession), the capitalist mode of production, on the contrary, systematically involves cooperation. No developed capitalist form of production is possible without cooperation and, therefore, capitalist production '*only then really begins ... when each individual capital employs simultaneously a comparatively large number of labourers*' (Marx, 1867, p. 223). It requires a material condition of central importance that has to be attained beforehand: the concentration of the means of production and subsistence in the hands of capitalists has to be large enough to provide them scope to buy the labour power of a great number of workers.

The capitalist controls the coordination function peculiar to cooperation not because he possesses any special coordinating skill or knowledge, but only because he can afford to gather many workers together, and he has the power to direct their actions because he already possesses enough funds to do so and not the other way round. In answer to the numerous authors who sought to vindicate the entrepreneur by virtue of his alleged capacity to steer an organisation, Marx (1867, p. 228) writes: 'It is not because he is a leader of industry that a man is a capitalist; on the contrary, he is a leader of industry because he is a capitalist. The leadership of industry is an attribute of capital, just as in feudal times the functions of general and judge, were attributes of landed property.'

This systematic use of cooperation in capitalist production gives the illusion of the ‘eternal necessity’ of the lords of capital. One could therefore come to believe that the surplus-value appropriated by the capitalist proceeds from his productive contribution as manager. But, Marx reminds us that the capitalist mode of production requires expansion of the extraction of surplus-value. This requirement of the system adds a second element to the direction function disconnected from cooperation as such. It makes the direction function despotic or authoritarian because the labour force has to create as much surplus-value as possible:

> the control of the capitalist is in substance two-fold by reason of the two-fold nature of the process of production itself, which, on the one hand, is a social process for producing use values, on the other, a process for creating surplus-value in form that control is despotic. (Marx, 1967, p. 227−228)

From the point of view of capital, the labour force has to be exploited as much as possible, which requires its subjection. This despotism obviously creates a resistance among workers who try not only to protect themselves from overexploitation but also to extend their relative autonomy at work despite the deskilling to which they have been subjected. These counter-pressures by the labour force constantly oblige capital to renew the technology and the organisation of the labour process to circumvent a loss of control.

In capitalist production, command is therefore double-sided: coordination comes from cooperation, despotism from the capitalistic character of production. On a theoretical level, nothing requires the direction function to become despotic. Despotism in capitalist production is not intrinsic to the need for coordination imposed by the social aspect of production; it is simply intrinsic to capitalism, which requires the expansion of surplus-value. To talk of ‘democracy in firms’, then, means nothing if we do not specify which kind of firm is involved.

Capitalist production is intrinsically despotic and the division of labour appears as one of the principal devices by which capital is able to exert real control over labour. By returning to the Babbage-Marx tradition we can see that Marglin does not fully grasp the particular nature of authority in the capitalist production process. Instead, he substitutes generalised authority in place of the double-sided command of capitalist production.

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